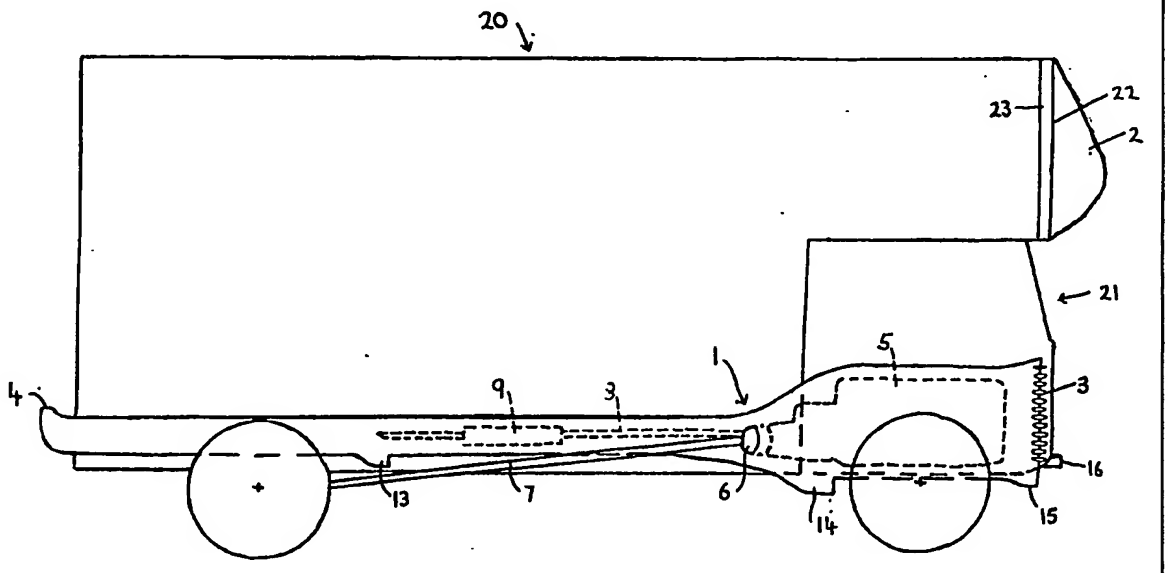
(12) UK Patent Application (19) GB (11) 2 068 851 A

(21) Application No 8102272
(22) Date of filing
26 Jan 1981
(30) Priority data
(31) 80/02687
(32) 26 Jan 1980
(33) United Kingdom (GB)
(43) Application published
19 Aug 1981
(51) INT CL³ B62D 35/00
(52) Domestic classification
B7B 343 348 PF
B7H A26A1 A26X A30B
(56) Documents cited
GB 1556161
GB 1347214
GB 1067863
GB 464131
GB 440298
US 3910623 A
(58) Field of search
B7B
B7H
(71) Applicant
Derek Bletsoe
12 Priory Park Road
Launceston
Cornwall
(72) Inventor
Derek Bletsoe
(74) Agents
M J Stephens & Co
Royal Building
11 St Andrew's Cross
Plymouth
PL1 2DS

(54) Drag-reducing arrangements for road vehicles

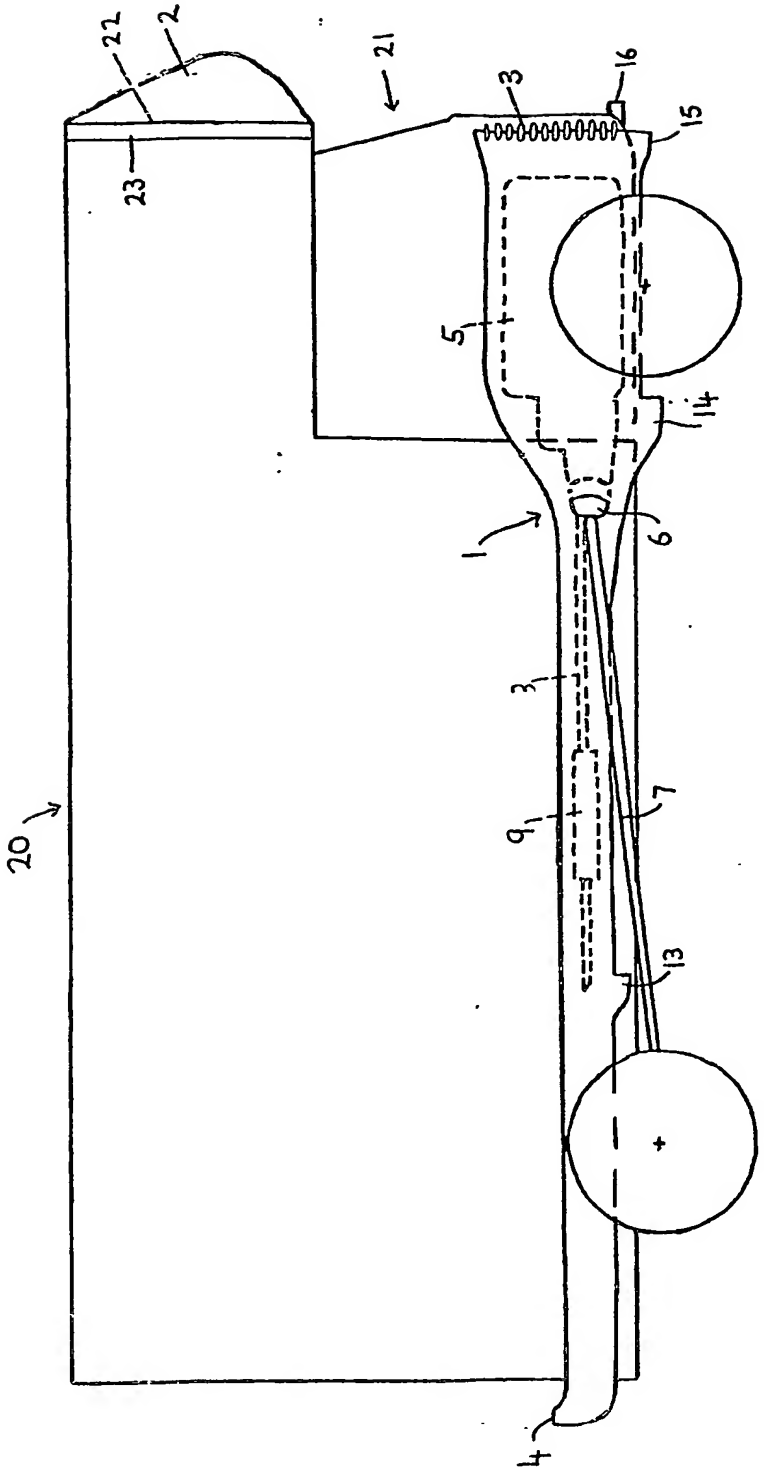
(57) Air ducting (1) extends longitudinally of the vehicle to channel air rearwardly and direct it into the low-pressure zone which forms immediately behind the vehicle, during forward motion. The ducting may surround the vehicle engine (5) and collect air passing through a radiator (3). Gases from the exhaust system (8) may be added to the air flow. The vehicle has an aerodynamic front fairing (2) attached or formed during construction to reduce frontal drag.

FIG. 1



GB 2 068 851 A

FIG. 1



2063851

FIG. 2

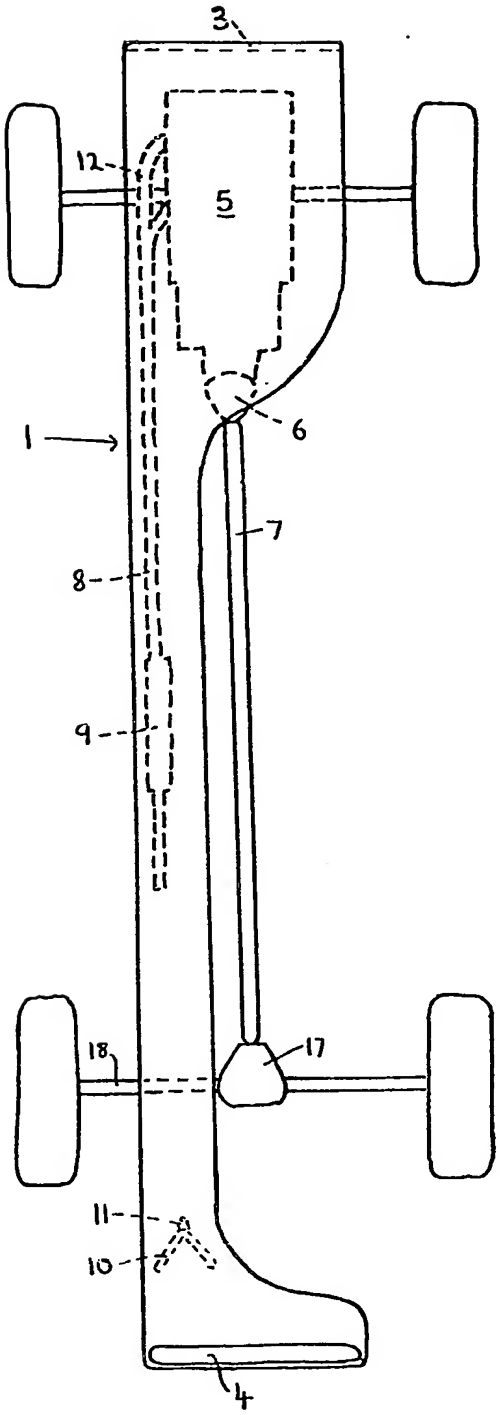


FIG. 4

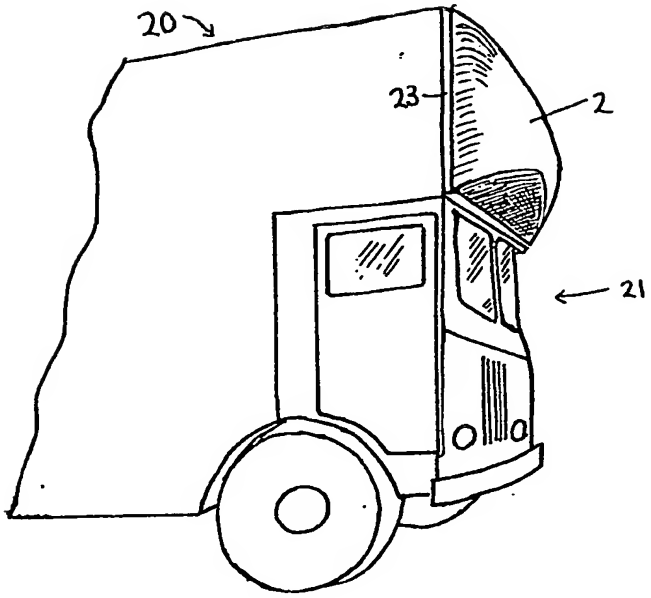
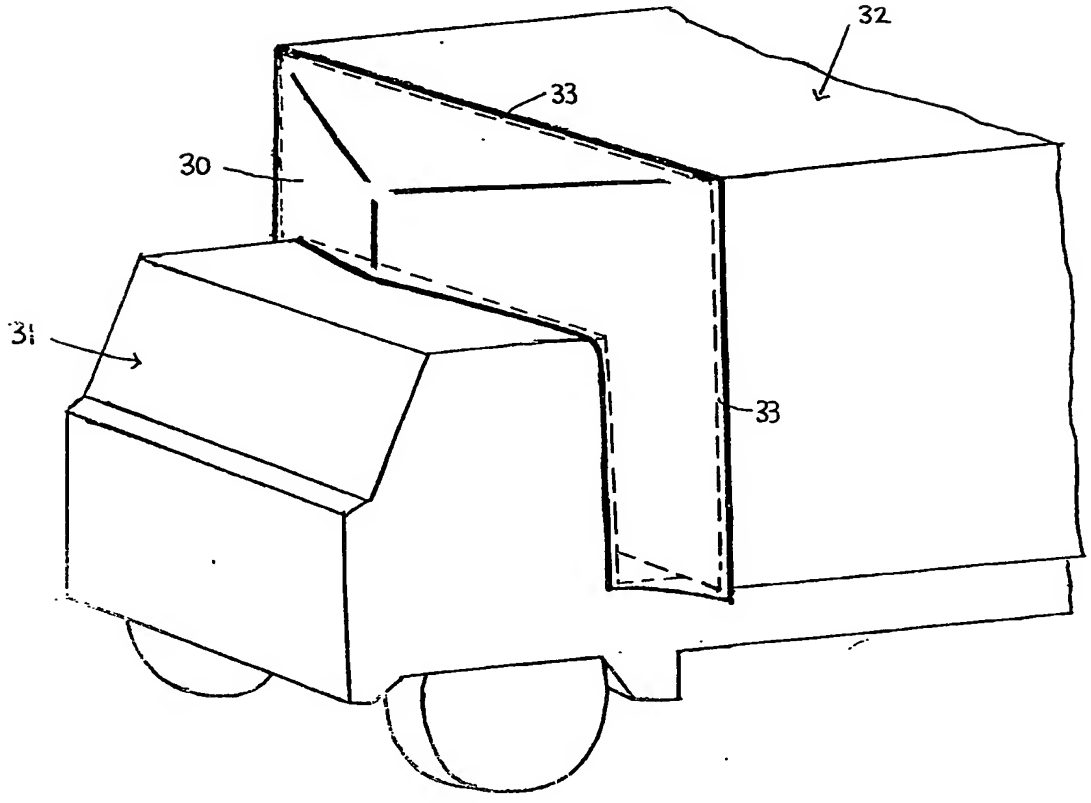


FIG. 5



2068851

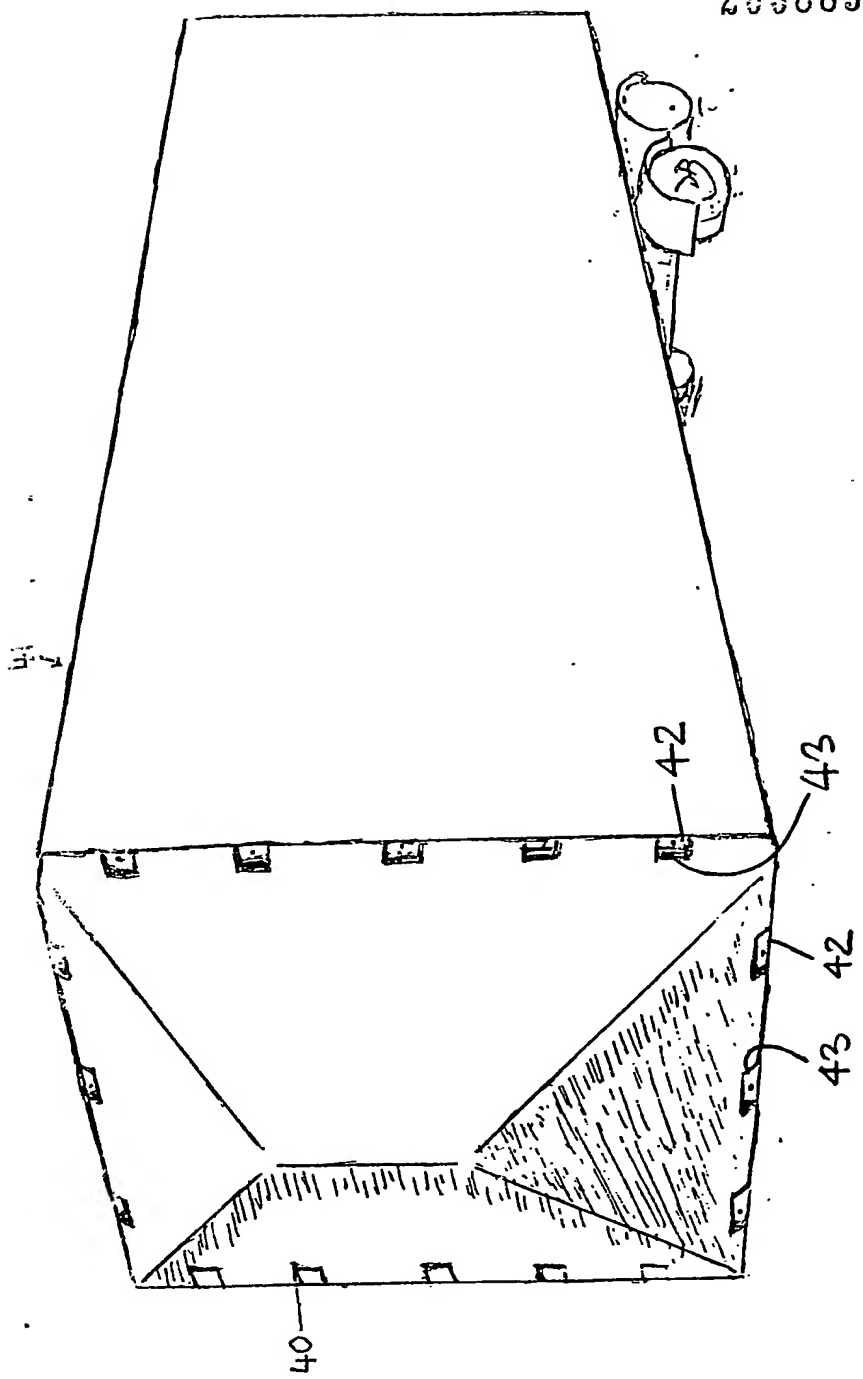
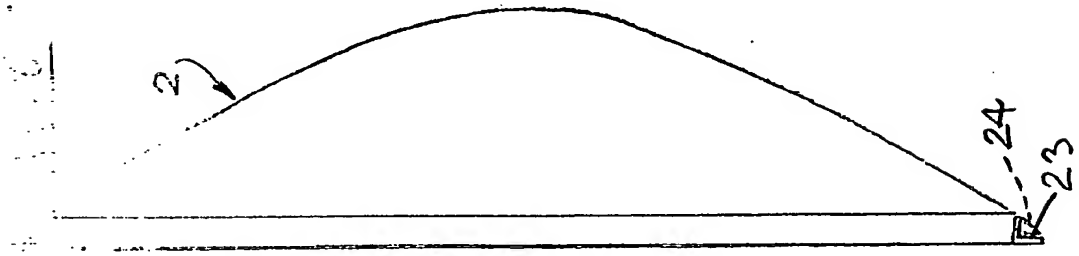


Fig. 6



SPECIFICATION

Drag-reducing arrangements for road vehicles

The present invention relates to drag-reducing arrangements for road vehicles such as, for example, box-van type lorries, Luton-bodied vehicles, and semi-trailers.

It is well known that the generally bluff-bodied shape of commercial and other road vehicles is far from ideal in terms of the aerodynamic properties of these vehicles. However, since the actual shape of a commercial vehicle is determined by a compromise between such factors as load-stowage capacity, manufacturing costs, and running costs, some measure of aerodynamic inefficiency is generally permitted even though this will lead to increased fuel costs in operation.

With the recent rapid rise of fuel costs, a number of proposals have been made to reduce vehicle drag and these proposals include the fitting of skirting to cars and air deflectors to the top of the driving cabs of box-van type lorries.

The present invention seeks to provide improved drag-reducing arrangements for road vehicles.

According to one aspect of the present invention, there is provided a road vehicle with air-flow ducting extending longitudinally thereof, said ducting being arranged to channel air rearwardly and direct it into the zone immediately behind the vehicle. The ducted air serves to reduce the low pressure area behind the vehicle during its forward movement and thereby reduce the drag on the vehicle.

Preferably, the forward end of the duct surrounds the vehicle's engine and is arranged to collect cooling air passing through the vehicle's radiator. The ducting can also be arranged to enclose the vehicle's exhaust system so that the exhaust gases are added to the rearward air flow. To cool the exhaust gases, means can be provided to inject a water mist into the exhaust system. The resultant wet steam increases the volumetric flow in the ducting.

Advantageously, the ducting is provided with at least one forwardly-facing scoop on its underside to take in slipstream air passing beneath the vehicle. A scoop communicating with the ducting may also be provided at the front of the vehicle below the fender bar.

The ducting can be provided in all types of vehicles, including articulated vehicles and motor cars. In the former case, a flexible ducting section would be provided to couple the tractor unit with the trailer or semi-trailer. In domestic cars, in order to increase flow into the front of the car, the radiator header tank is preferably located remote from the radiator.

According to another aspect of the present invention, there is provided a road vehicle with a load-stowage compartment bounded by wall means including a front wall, said front wall forming or being covered externally by an aerodynamic fairing at least in a zone of the front wall which is, or would otherwise be, exposed to the oncoming air stream during forward movement of the vehicle, said fairing joining along upper and side peripheral portions with said wall means.

The streamlining provided by the fairing enables substantial fuel economies to be achieved when operating the vehicle.

The fairing can be built into the vehicle during the manufacture of the vehicle or can be added later. In this latter case, the fairing is preferably provided with a peripheral flange or flanges facilitating its attachment to the wall means of the vehicle.

Where the vehicle is a semi-trailer or trailer, the fairing preferably extends over the whole of the front of the vehicle. For a vehicle such as a Luton-bodied lorry, the fairing will be positioned on the front wall of the vehicle directly above the driving cab. For box vans and lorries in which the driving cab is separate from but on the same chassis as the load-stowage body, the fairing can be used to provide a smooth transition between the rear of the cab and the front profile edges of the body.

According to a further aspect of the invention, there is provided an aerodynamic fairing for fitting over a forwardly-facing surface of a bluff body portion of a road vehicle, said fairing including attachment means enabling the fairing to be attached to said body portion with at least the side and top peripheral portions of the fairing up against said body portion, so as to cover said forwardly-facing surface and reduce the aerodynamic drag presented thereby in forward motion of the vehicle.

The attachment means may comprise a peripheral flange or flanges for fixing to peripheral portions of said forwardly facing surface.

In an alternative embodiment of the invention the attachment means comprise plate elements or lugs arranged at intervals around the periphery of the fairing for fixing to the body portion by rivets, bolts or other fixing means, the plate elements or lugs being accessible from the front of the fairing through recessed peripheral portions of the fairing.

Various other novel aspects and features of the invention will become apparent from the following description, given by way of example, of three road vehicles fitted with drag-reducing arrangement of the invention, reference being made to the accompanying diagrammatic drawings, in which:

Figure 1 is a side elevation of a Luton-bodied vehicle with partially-concealed air-flow ducting of the vehicle being shown throughout its length in full lines for clarity.

Figure 2 is a plan view of the air-flow ducting of Fig. 1 showing its position relative to the engine and drive transmission of the vehicle;

Figure 3 is a plan view of an aerodynamic fairing of the vehicle shown in Fig. 1, according to an embodiment of the present invention;

Figure 4 is a perspective view of the front end portion of the vehicle shown in Fig. 1, showing the aerodynamic fairing;

Figure 5 is a perspective view of the front end portion of a box-van type vehicle fitted with an aerodynamic fairing; according to another embodiment of the invention, and

Figure 6 is a perspective view of a semi-trailer fitted with an aerodynamic fairing according to a further embodiment of the invention.

The Luton-bodied vehicle shown in Figs. 1 to 4 is provided with two drag-reducing arrangements, these being ducting 1 channelling a rearward air flow and an aerodynamic fairing or nose-cone 2.

The ducting 1 is arranged to take in air flowing through the vehicle's radiator 3 and to channel this air to the rear of the vehicle where it passes through a broad outlet opening 4 into the low-pressure zone immediately behind the vehicle. The flow of air into this low-pressure zone serves to reduce drag on the vehicle. The cross-sectional area of the ducting 1 is made as large as is conveniently possible to maximise the flow of air therethrough.

The ducting 1 encloses the vehicle's engine 5 and runs down the exhaust-system side of the vehicle's chassis crossing the gearbox 6 before the prop shaft 7 (the gearbox 6 passing out of the ducting 1 through a flexible seal, not shown). The ducting 1 also encloses the engine exhaust system 8, including the silencer 9, so that the exhaust gases are added to the rearward air flow to produce additional gas flow volume. The ducting 1 passes to one side of the rear-axle differential unit 17 above the corresponding half shaft 18.

The ducting outlet opening 4 is upwardly directed and is positioned below the vehicle's tailboard. The sharp bend in the ducting adjacent the outlet opening 4 does not significantly inhibit the flow of air out of the ducting 1. The outlet opening 4 can be provided with a lightweight cover (not shown) for example, of aluminium. This cover is arranged to lift open under a light airflow and fall back when the vehicle is stationary to prevent the ingress of rain into the ducting 1 through the opening 4.

The allow for the possibility of air-borne water particles entering the ducting 1, drain channels 10 are impressed in the ducting floor, these channels 10 leading to the drain hole 11.

Along the underside of the ducting 1, forwardly facing scoops 13 and 14 are provided to collect air trapped beneath the vehicle. A further scoop 15 is provided at the front of the vehicle below and behind the fender bar 16 to collect air forced down by the lower front bodywork of the vehicle. The scoop 15 extends substantially the full width of the vehicle.

In the region of the engine 5 and gearbox 6, the ducting can be provided with quick-release panels (not shown) allowing easy access for maintenance and repair. The ducting 1 can also be provided with a removable section giving access to the exhaust system 8.

Furthermore, means (not shown) may be provided to inject a water mist into the exhaust system 8 downstream of the exhaust manifold 12 in order to reduce the temperature of the exhaust gases and enable plastics materials to be used for the exhaust piping and ducting 1. The injection of a water mist also creates wet steam which increases the volume of the rearwardly flowing gases.

Although the ducting 1 is shown as passing to one side of the differential unit 17, the ducting could be symmetrically disposed about the prop shaft 7 so that it passes the unit 17 on both sides.

To increase the effectiveness of the ducting 1 at high vehicle speeds, the radiator 3 is preferably relocated away from the inlet end of the ducting 1 so that a greater air flow can be achieved therethrough.

The load-stowage compartment 20 of the vehicle is forwardly bounded by the driving cab 21 and a front wall 22 positioned above the front of the cab 21. It is this front wall 22 which is covered with the aerodynamic fairing or nose-cone 2. The shape of the nose-cone 2 can be seen from Figs. 1, 3 and 4 and is such that the view of the driver is unimpeded.

The nose-cone 2 is, for example, in the form of a fibre-glass moulding and is provided with peripheral flanges 23 by means of which the nose-cone 2 is joined by rivets or bolts to the sidewalls and roof of the compartment 20. The flanges 23 may be covered by coving strips 24 (shown in broken outline in Fig. 3) which afford an external surface aerodynamically continuous with the fairing surface.

The provision of the nose-cone 2 gives an overall improvement of efficiency (measured in terms of fuel comsumption) of typically 10%, this figure being higher for motorway operation. The top speed attainable by the vehicle is also increased.

The nose-cone also greatly reduces waterproofing problems on the front corners of the compartment 20.

The illustrated nose-cone 2 is intended to be fitted onto existing vehicles. However, it is of course possible to incorporate the nose cone 2 at the time of manufacture of the vehicle, which would save on overall cost. In

this latter case, the front wall 22 could be dispensed with.

An aerodynamic fairing can with advantage be provided at the front of any vehicle bluff-body portion which would normally be exposed to the oncoming airstream. Thus, in Fig. 5 there is shown a box-van type vehicle provided with a fairing 30 extending between the rear of the driving cab 31 and the front of the load-stowage compartment 32. As with the fairing 2, the fairing 30 meets with the compartment 32 along its side and top front edges. The fairing 30 is provided with flanges 33 facilitating its attachment to the compartment walls. The form of fairing 30 as shown in Fig. 5 can be modified where it mates with the cab 31 to provide for tilting of the cab.

In the case of a semi-trailer (Fig. 6), the whole of the front of the trailer is preferably fitted with an aerodynamic fairing 40 secured to the trailer body 41. The fixing of the fairing 40 to the body 41 may be effected by peripheral flanges, as described previously, or, as shown diagrammatically in Fig. 6, by means of fixing plates or lugs 42 arranged at intervals around the periphery of the fairing and accessible from the front of the fairing through recessed peripheral portions 43 formed in the fairing.

CLAIMS

1. A road vehicle with air-flow ducting extending longitudinally thereof, said ducting being arranged to channel air rearwardly and direct it into the zone immediately behind the vehicle.

2. A road vehicle according to Claim 1, in which the forward end of the ducting surrounds the vehicle's engine and is arranged to collect cooling air passing through the vehicle's radiator.

3. A road vehicle according to Claim 1 or Claim 2, in which the ducting communicates with or includes the vehicle engine's exhaust system so that the engine exhaust gases are added to the rearward air flow.

4. A road vehicle according to Claim 3, including means for injecting a water mist into the exhaust system to increase the volumetric flow in the ducting.

5. A road vehicle according to any one of the preceding claims, in which the ducting is provided with at least one forwardly-facing scoop on its underside to take in slipstream air passing beneath the vehicle.

6. A road vehicle according to any one of the preceding claims, in which the vehicle is an articulated vehicle having a trailer or semi-trailer and a tractor unit, and the air flow ducting includes a flexible ducting section.

7. A road vehicle with a load-stowage compartment bounded by wall means including a front wall, said front wall forming or being covered externally by an aerodynamic fairing at least in a zone of the front wall which is, or would otherwise be, exposed to the oncoming air stream during forward movement of the vehicle, said fairing joining along upper and side peripheral portions with said wall means.

8. A road vehicle according to Claim 7, in which the vehicle is a semi-trailer or trailer, and the fairing extends over the whole of the front of the vehicle.

9. A road vehicle according to Claim 7 having a driver's cab and a luton body, the fairing being positioned on the front wall of the body directly above the cab.

10. A road vehicle according to Claim 7, having a driving cab separate from but on the same chassis as a load-stowage body, in which the fairing provides a smooth transition between the rear of the cab and the front profile edges of the said body.

11. An aerodynamic fairing for fitting over a forwardly facing surface of a bluff body portion of a road vehicle, said fairing including attachment means enabling the fairing to be attached to said body portion with at least the side and top peripheral portions of the fairing up against said body portion so as to cover said forwardly-facing surface and reduce the aerodynamic drag presented thereby in forward motion of the vehicle.

12. An aerodynamic fairing according to Claim 11, in which the attachment means comprises a peripheral flange or flanges for fixing to peripheral portions of said forwardly-facing surface.

13. An aerodynamic fairing according to Claim 11, in which the attachment means comprise plate elements or lugs arranged at intervals around the periphery of the fairing for fixing to the body portion by rivets, bolts or other fixing means, the plate elements or lugs being accessible from the front of the fairing through recessed peripheral portions of the fairing.

14. An aerodynamic fairing according to Claim 12 or Claim 13, including coving elements covering the fixing flange or flanges, or the recessed plate elements or lugs, to provide an external surface which is aerodynamically continuous with the fairing.

15. An aerodynamic fairing according to any of Claims 11 to 14, in which the fairing has a rounded nose or apex which is symmetrically located with respect to the lateral edges of the fairing and is asymmetrically located with respect to the upper and lower edges of the fairing, being closer to the lower edge than the upper edge.

16. An aerodynamic fairing, or a vehicle provided therewith, substantially as herein described with reference to an as shown in Figs. 1, 3, 4, 5 or 6 of the accompanying drawings.

17. A road vehicle according to Claim 1, substantially as herein described with reference to and as shown in Figs. 1 and 2 of the

accompanying drawings.

Printed for Her Majesty's Stationery Office
by Burgess & Son (Abingdon) Ltd.—1981.
Published at The Patent Office, 25 Southampton Buildings,
London, WC2A 1AY, from which copies may be obtained.